Achnanthes lanceolata (Breb.) Grun. (Pl. ii, fig. 3).—Hust. in Rab. Krypt., Bd. 7, Ht. 2, p. 408. Synonyms: *Achnanthidium lanceolatum* Breb., *Achnanthes haynaldi* var. *oblonga-elliptica* Schwarschmidt, *Stauroneis truncata* Schum., *Achnanthidium lanceolatum* var. *genuina* A. Mayer, *Achnanthidium lanceolatum* var. *minima* A. Mayer, *Achnanthidium lanceolatum* var. *conspicua* A. Mayer, *Achnanthes lanceolata* f. *typica*, f. *pura* and f. *semipura* A. Mayer, *Achnanthidium lanceolatum* var. *rhomboidalis* A. Mayer, *Achnanthes lanceolata* var. *maxima* Per., *Achnanthes pseudoantigua* Per., *Achnanthes pagesi* Per. (Hust.)

Distribution: World-wide.

Hustedt lists several varieties and forms of this species which exhibits considerable range in shape and size. Although a certain amount of slight variation has been observed in the Macquarie Island material, it is doubtful whether identification beyond the level of species is necessary.

Achnanthes linearis Grun.—Hust. in Rab. Krypt., Bd. 7, Ht. 2, p. 378. Synonyms: *Achnanthidium lineare* W. Smith, *Achnanthidium jackii* Rab., *Achnanthes linearis* var. *jackii* Grun. (Hust.)

Distribution: Magellans. (Only other antarctic record.)

Achnanthes minutissima var. *cryptocephala* Grun.—Sch. At., t. 410, figs. 51–53; Hust. in Rab. Krypt., Bd. 7, Ht. 2, p. 377.

Distribution: Europe, Asia, Arctic. (From DeToni.)

Should be compared with *Achnanthes exilis* K., *Achnanthes linearis* (W. Smith) Grun. and *Achnanthes affinis* Grun. The Macquarie Island material has been found to agree best with *Achnanthes minutissima* var. *cryptocephala* Grun. but the boundary line between this and the other three species does not appear to be very well defined.

Note.—The determination of *A. affinis*, *A. exigua*, *A. exilis* and *A. minutissima* var. *cryptocephala* should not be regarded as definite. The material to which these names were assigned was extremely fine-structured and difficult to examine even with an oil immersion lens system. Therefore the names allocated should be taken as indicating only the most probable taxonomic position. The existing synonymy reflects the difficulties which surround the identification of such material. Diatoms belonging to this group appeared to be present in all the samples examined, but only as minor constituents of the total populations. Mention of their presence has been restricted to this section.

Achnanthes subsalsa Peterson (Pl. ii, fig. 7).—Hust. in Rab. Krypt., Bd. 7, Ht. 2, p. 401. Should be compared with *Cocconeis apiculata* A.S. in Sch. At., t. 198, fig. 41.

AMPHORA Ehrenberg.

Amphora delicatissima Krasske (Text-fig. 19).—Hust. in Die Süsswasser-flora Mitteleuropas, Ht. 10, p. 346, fig. 635, (1930).

COCCONEIS Ehrenberg.

Cocconeis placentula Eh. (Text-fig. 23).—Hust. in Die Süssw. Mitt., Ht. 10, p. 189, fig. 260, (1930).

Distribution: Falkland Island. (Only other antarctic record.)

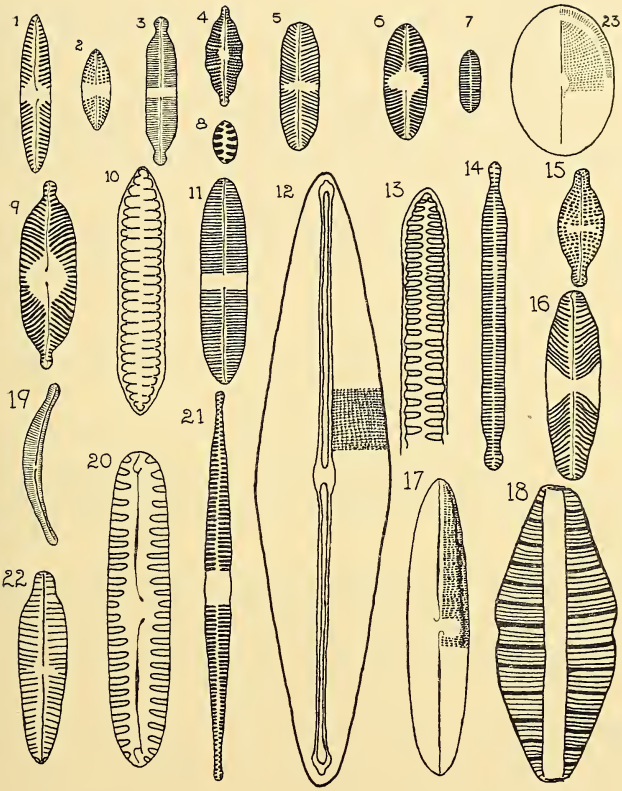
COSCINODISCUS Ehrenberg.

? *Coscinodiscus* spp.—Small fragments of discs were occasionally observed, but never a complete specimen. The material has been associated for convenience with this genus, five species of which have been recorded previously in the antarctic.

CYMATOPLEURA W. Smith.

Cymatopleura solea Breb. var. *regula* (Eh.) Grun. (Text-fig. 10).—Hust. in Die Süssw. Mitt., Ht. 10, p. 426, fig. 823*b*, (1930); Sch. At., t. 276, figs. 10, 11 (*C. regula* (Eh.) Ralfs). Synonyms: *Cymatopleuram regulam* (Eh.) Pritch., *Cymatopleura regula* (Eh.) Ralfs, *Surirella regula* Eh., *Cymatopleura parallela* W. Smith. (DeToni.)

Distribution: Mexico, Europe. *C. solea* Breb. recorded from Graham Land.



Text-figs. 1-23.

1, *Pinnularia nivorum* Per. var? 26 × 5 μ. 13 costae/ 10 μ. 2, *Navicula mutica* Kutz. 13 × 5 μ. 10 striae/ 5 μ. 3, *Stauroneis pygmaea* Kreiger. 24 × 5 μ. 30 costae/ 10 μ. 4, *Navicula mutica* Kutz. var? 16 × 6 μ. 24 striae/ 10 μ. 5, *Navicula seminulum* Grun.. 21 × 6 μ. 16-18 costae/ 10 μ. 6, *Pinnularia microstauron* (Eh.) Cleve var. *Brebissonii* (Kutz.) Hust. 19 × 7 μ. 20 costae/ 10 μ. 7, *Achnanthes Biasolettiana* Grun. 10 × 3·5 μ. 23-25 costae/ 10 μ. 8, *Fragilaria pinnata* Eh. 7 × 4 μ. 10 costae/ 10 μ. 9, *Pinnularia* (*interrupta*?) W. Smith. 30 × 9 μ. 16 costae/ 10 μ. 10, *Cymatopleura solea* Breb. var *regula* (Eh.) Grun. 40 × 7 μ. 11, *Pinnularia fasciata* Lagerst. 34 × 7 μ. 20 costae/ 10 μ. 12, *Frustulia rhomboides* (Eh.) DeToni. 100 × 22 μ. 13, ? *Surirella engleri* O.M. forma *angustior* O.M. 80 × 7 μ. 14, *Fragilaria bicapitata* A. Mayer. 50 × 4 μ. 17 costae/ 10 μ. 15, *Navicula mutica* Kutz. var? 19 × 8 μ. 15 striae/ 10 μ. 16, *Pinnularia Atwoodii* Per. 30 × 9 μ. 15 costae/ 10 μ. 17, *Neidium affine* (Eh.) Cleve. 48 × 10 μ. 28 striae/ 10 μ. 18, *Rhopalodia gibberula* (Eh.) O.M. var *baltica* O.M. Length 48 μ. 19, *Amphora delicatissima* Krasske. 26 × 3 μ. 30 costae/ 10 μ. 20, *Pinnularia borealis* Eh. 50 × 10 μ. 6 costae/ 10 μ. 21, *Fragilaria capucina* Desm. 63 × 4·5 μ. 15 costae/ 10 μ. 22, *Gomphonema angustatum* (Kutz.) Rab. var. *producta* Grun. 31 × 8 μ. 12 costae/ 10 μ. 23, *Cocconeis placentula* Eh. 25 × 16 μ. 25 striae/ 10 μ.

In all figures, 10 μ = approximately 10 mm.

CYMBELLA Agardh.

Cymbella pusilla Grun. var. ? (Pl. ii, fig. 5).—Hust. in Die Süssw. Mitt., Ht. 10, p. 354, fig. 646, (1930).

The type which occurs on Macquarie Island has consistently parallel striae and differs in this respect from the type figured and described by Hustedt in which the striae are somewhat radiate.

DIATOMELLA Greville.

Diatomella Balfouriana Grev. (Pl. ii, fig. 8).—Hust. in Die Süssw. Mitt., Ht. 10, p. 214, fig. 312, (1930); Prit. Inf., p. 810, Pl. IV, figs. 51, 52. Synonyms: *Grammatophora ? Balfouriana* W. Smith, *Disiphonia australis* Eh. (DeToni.)

Distribution: World-wide.

DIPLONEIS Ehrenberg.

Diploneis Smithii (Breb.) Cleve. (Pl. ii, fig. 6).—Hust. in Die Süssw. Mitt., Ht. 10, p. 253, fig. 402, (1930); Sch. At., t. 7, figs. 14–22. Synonyms: *Navicula Smithii* Breb., *Navicula elliptica* W. Smith.

Distribution: World-wide.

EUNOTIA Ehrenberg.

Eunotia alpina (Naeg.) Hust. (Pl. ii, fig. 12).—Hust. in Die Süssw. Mitt., Ht. 10, p. 185, fig. 252, (1930); Sch. At., t. 291, figs. 7, 8.

Distribution: Magellans. (Only other antarctic record.)

The apical swellings were slightly more developed in the Macquarie Island specimens than in the figure shown by Hustedt.

Eunotia lunaris Grun. (Pl. ii, fig. 11).—Hust. in Die Süssw. Mitt., Ht. 10, p. 183, (1930). Synonyms: *Pseudoeunotia lunaris* (Eh.) Grun., *Synedra lunaris* Eh., *Exilaria lunaris* Hass., *Exilaria curvata* K., *Eunotia curvata* Lagerst., *Synedra campyla* Hilse. (DeToni.)

Distribution: World-wide.

Having 22-25 striae/ 10μ, and being only 3μ wide, this diatom agrees more closely with the variety *subarcuata* (Naeg.) Grun., but the apices are bulbous rather than tapered. Varietal assignation has therefore been omitted.

Eunotia trinacria Krasske. (Pl. ii, fig. 10).—Hust. in Die Süssw. Mitt., Ht. 10, p. 176, figs. 221*a-d*, (1930).

FRAGILARIA Lyngbye.

Fragilaria bicapitata A. Mayer. (Text.-fig. 14).—Hust. in Die Süssw. Mitt., Ht. 10, p. 143, fig. 148, (1930).

Fragilaria capucina Desm. (Pl. ii, figs. 13, 14; Text-fig. 21).—Hust. in Die. Süssw. Mitt., Ht. 10, p. 138, fig. 126, (1930); Prit. Inf., p. 776, Pl. IX, figs. 173, 174; Pl. XIV, figs. 1, 2; Sch. At., t. 298; W. Smith, Synops. Brit. Diat., vol. 2, p. 22, Pl. XXXV, fig. 296. Synonyms: *Staurosira capucina* Borzsc., *F. ventriculus* Eh., *F. pectinalis* Lyngb., *F. tenuis* Ag., *F. rhabdosoma* Eh., *F. diophthalma* Eh., *F. multipunctata* Eh., *F. bipunctata* Eh., *F. angusta* Eh., *F. scalaris* Eh., *F. fissa* Eh., *F. sepes* Eh., *F. pusilla* Breb., *F. corrugata* K., *Nematoplata argentea* Bory, *Nematoplata capucina* Bory, *Bacillaria pectinalis* Nitzsch., *Diatomosira pectinalis* Trev., *Bacillaria multipunctata* Eh.

Distribution: World-wide, including Falkland Island and Marion Island in the antarctic.

The great variability of this species is indicated by the synonymy. (From DeToni.)

Fragilaria Harrisonii (W. Sm.) Grun. (Pl. ii, fig. 9).—Hust. in Die Süssw. Mitt., Ht. 10, p. 139, fig. 132, (1930); Sch. At., t. 296, figs. 6–18; W. Smith, Synops. Brit. Diat., vol. 2, p. 18, Pl. LX, figs. 373, 374. Synonyms: *Odontidium Harrisonii* W. Sm., *Biblarium leptostauron* Eh., *Diatoma Harrisonii* Cleve, *Staurosira Harrisonii* Cleve. (DeToni.)

Distribution: Common in northern hemisphere.

Fragilaria pinnata Eh. (Text-fig. 8).—Hust. in Die Süssw. Mitt., Ht. 10, p. 142, figs. 141*a-d*, (1930); Sch. At., t. 298, figs. 47–74.

Fragilaria virescens Ralfs. (Pl. ii, fig. 15).—Hust. in Die Süssw. Mitt., Ht. 10, p. 142, fig. 144, (1930); Sch. At., t. 297, many figs. Synonyms: *F. undata* W. Sm., *F. constricta* Eh., *F. construentum* (*binodum*) Eh., *F. pectinalis* Eh., *F. equalis* Heib., *Diatoma virescens* Hass., *F. confervoides* Grev., *Diatoma sulphurescens* Ag., *Staurosira equalis* Cleve and Müller. (DeToni.)

Distribution: Ross Island and South Victoria Land. (Only other antarctic records.)

F. virescens, according to Hustedt, is 12–120μ long and 5–10μ across the valve. The forms examined differ from these measurements, being only 3–4μ across the valve. The length, 40–45μ, is fairly constant. Occurrence is restricted to fossil peats.

Fragilaria (*virescens* ?) Ralfs. (Pl. ii, fig. 4).—This material is 15–20μ in length, 3–4μ across the valves and has 21–23 striae/10μ. It represents a type quite distinct from that listed above and occurs both as a fossil and as a living constituent of the present algal flora. It has been placed with some doubt as *F. virescens*.

FRAGILARIOPSIS Hustedt.

Fragilariopsis antarctica Castr. (Pl. ii, fig. 18).—N. Ingram Hendey, "The Plankton Diatoms of the Southern Seas" in Discovery Reports, vol. XVI, 1937, p. 332; Sch. At., t. 299, figs. 9–14. Synonyms: *Fragilaria antarctica* Castr., *Denticula tenuis* K. var. *antarctica* Fritsch. (Hendey.)

Distribution: Very common antarctic oceanic diatom. Also Cape Adare, Bouvet Island and Heard Island.

FRUSTULIA Agardh.

? *Frustulia minuta* Rab. (Pl. ii, fig. 19).—Prit. Inf., p. 924. Synonym: *Synedra frustulum* K. (Pritchard.)

Only outline and raphe visible. Identification doubtful.

Frustulia rhomboides (Eh.) DeToni. (Text-fig. 12).—Hust. in Die Süssw. Mitt., Ht. 10, p. 220, fig. 324, (1930). Synonym: *Vanheurckia rhomboides* Breb. (DeToni.)

Distribution: World-wide.

GOMPHONEMA Agardh.

Gomphonema angustatum (K.) Rab. var. *producta* Grun. (Text-fig. 22).—Hust. in Die Süssw. Mitt., Ht. 10, p. 373, fig. 693, (1930).

The figure shown in Sch. At., t. 234, fig. 26 does not agree with that of Hustedt. Schmidt, in the same table, presents a series of figures of *G. angustatum* K. and it is clear that there is wide and continuous variation exhibited by the species so that the naming is probably somewhat artificial.

Gomphonema intricatum K. (Pl. ii, fig. 17).—Sch. At., t. 235, fig. 15. Synonyms: *G. dichotomum* K., *G. vibrio* Eh., *G. cygnus* Eh. (DeToni.)

Distribution: World-wide.

In this case the figure shown by Hustedt does not agree with Schmidt's Atlas. Again, the most appropriate authority has been chosen.

Gomphonema parvulum (K.) Grun. (Pl. ii., fig. 16).—Hust. in Die Süssw. Mitt., Ht. 10, p. 372, fig. 713*a*, (1930); Sch. At., t. 234, fig. 2. Synonyms: *Sphenella parvula* K., *Gomphonema minutissimum* Breb., *Gomphonella parvula* Rab., *Sphenella rostellata* K., *Gomphonema rostellatum* Rab., *Gomphonema Lagenula* (K.) Rab., *Gomphonema rostratum* W. Sm., *Gomphonema tenellum* W. Sm. (DeToni.)

Distribution: World-wide.

HANTZSCHIA Grunow.

Hantzschia amphioxys (Eh.) Grun. (Pl. ii, fig. 28).—Hust. in Die Süssw. Mitt., Ht. 10, p. 394, fig. 747, (1930). Synonyms: *Eunotia amphioxys* Eh., *Navicula amphioxys* Westend, *Nitzschia amphioxys* W. Sm. (DeToni.)

Distribution: World-wide.

Specimens typical of Hustedt's fig. 747 are of infrequent occurrence. Most of the material has closer affinities with the variety *maior* Grun. (Hustedt's fig. 749) although the size range is well below the range quoted for this variety. For this reason, varietal subdivisions have been avoided.

MELOSIRA Agardh.

Melosira granulata (Eh.) Ralfs. (Pl. ii, figs. 20*a* and *b*).—Hust in Die Süssw. Mitt., Ht. 10, p. 87, fig. 44, (1930). Synonyms: *Gallionella granulata* Eh., *Gallionella marchica* Eh., *Gallionella procera* Eh., *Gallionella tenerima* Eh., *Melosira ordinata* K., *Orthosira punctata* W. Sm. (DeToni.)

Distribution: World-wide.

? *Melosira* spp.—Small discs, usually with undefinable structure, have been placed for convenience with this genus. The possibility that they may represent one or more of the following genera (*Thalassiosira* Cleve, *Cyclotella* K., *Stephanodiscus* Eh.) should not be overlooked.

NAVICULA Bory.

Navicula mutica K. (vars ?) (Text-figs. 2, 4, 15).—Hust. in Die Süssw. Mitt., Ht. 10, p. 274, fig. 453*a-e*, (1930). Synonyms: *Stauroneis Dumontii* Breb., *Stauroneis polymorpha* Lagerst., *Navicula Semen* Eh., *Stauroneis Semen* Eh., *Stauroneis Cohnii* Rab. (DeToni.)

Distribution: World-wide.

With the variation in form of this species shown by Hustedt it is difficult to understand how there can be any justification or necessity for erecting the separate species *Navicula muticopsis* V.H. (W. and G. S. West, Fresh Water Algae, Brit. Ant. Exp., 1907–9, vol. 1, pt. 7, p. 283, Pl. XXVI, figs. 121–124; Peragallo, Diatomées d'Eau Douce, Expedition Antarctique Francais, 1908–10, p. 17, Pl. 1, fig. 40), *Navicula muticopsiforme* W. and G. S. West (these authors in Brit. Ant. Exp. as above, p. 284, Pl. XXVI, fig. 131), *Navicula dicephala* Eh. (F. E. Fritsch, Fresh Water Algae, Brit. Ant. Exp., 1910, Bot., pt. 1, p. 14, Pl. 1, fig. 32) and *Navicula globiceps* Greg. (W. and G. S. West in Brit. Ant. Exp. as above, p. 284, Pl. XXVI, fig. 135; F. E. Fritsch, Fresh Water Algae, Nat. Ant. Exp., 1901–4, vol. VI, p. 52, Pl. III, figs. 154, 155).

Navicula dicephala Eh., as described by Fritsch, has punctate striae and so does not agree with the *Navicula dicephala* Eh. described by Hustedt (Die Süssw. Mitt., Ht. 10, p. 302, fig. 526) in which the striae are unbroken. Fritsch, in fact, expresses his doubts regarding the naming, and states that the diatom named by him *Navicula muticopsis* V.H. (J. Linn. Soc., Bot., XL, p. 336, Text-fig. B) is identical with *Navicula dicephala* Eh. There is some disagreement between *Navicula globiceps* Greg. (Fritsch, Nat. Ant. Exp., 1901–4, vol. VI, p. 52) with punctate striae and *Navicula globiceps* Greg. (W. and G. S. West, Brit. Ant. Exp. as above) with broken striae. Fritsch's reference is Gregory's original description so that the name by W. and G. S. West may be misapplied.

The following list of probable affinities should be noted:

Navicula mutica var. *ventricosa* (K.) Cleve very similar to *Navicula globiceps* Greg.

——— ——— var. *Cohnii* (Hilse) Grun. very similar to *N. muticopsiforme* W. & G.S.W.

——— ——— var. *truncata* Per. identical with *N. muticopsis* V.H.

——— ——— var. *binodis* Hust. symmetric form of *N. mutica* var. *cymbelloides* Per.

Navicula mutica, var. *truncata* Per., var. *Cohnii* (Hilse) Grun, and var. *nivalis* (Eh.) Hust. have been observed in the samples from Macquarie Island.

Navicula (*rostellata* ? K.) (Pl. ii, fig. 21).—Sch. At., t. 47, figs. 28, 29. *Navicula rostellata* K., as listed by Hustedt (Die Süssw. Mitt., Ht. 10, p. 297, fig. 502) has unbroken striae. Synonym: *Navicula rhyncocephala* K. var. *rostellata* Grun. (Cleve and Grunow; DeToni.) The species is queried because of the disagreement between Schmidt and Hustedt.

Navicula seminulum Grun. (Text-fig. 5).—Hust. in Die Süssw. Mitt., Ht. 10, p. 272, fig. 443.

Distribution: Cape Adare. (Only other antarctic record.)

NEIDIUM Pfitzer.

Neidium affine (Eh.) Cleve. (Text-fig. 17).—Hust. in Die Süssw. Mitt., Ht. 10, p. 242, fig. 376, (1930); W. Sm., Synops. Brit. Diat., I, p. 50, Pl. XVI, fig. 143 (*Navicula affinis* Eh.); Sch. At., t. 49, figs. 20–23. Synonyms: *Navicula iridis* var. *affinis* Eh., *Navicula affinis* Eh., *Navicula ampliata* Eh. (DeToni.)

Distribution: World-wide.

This species was identified directly from a slide mount prepared by West.

OPEPHORA Petit.

Opephora Martyi Heribaud. (Pl. ii, fig. 22).—Hust. in Die Süssw. Mitt., Ht. 10, p. 132, fig. 120, (1930).

PINNULARIA Ehrenberg.

Pinnularia appendiculata (Ag.) Cleve. (Pl. ii, fig. 23).—Hust. in Die Süssw. Mitt., Ht. 10, p. 317, fig. 570*a*, (1930). Synonyms: *Frustulia appendiculata* Ag., *Cymbella appendiculata* Ag., *Navicula obtusa* Eh.

Distribution: Graham Land, Falkland Island, Cape Horn. (Antarctic records.)

The similarity between this species and *Pinnularia molaris* Grun. should be noted.

Pinnularia Atwoodii Per. (Text-fig. 16).—Peragallo, Diatomées d'Eau Douce, Expedition Antarctique Francais, (Bot.), p. 20, Pl. I, fig. 17 (1908–10).

Distribution: Quinipiac River, U.S.A. (Only other record.)

Peragallo points out affinities between this species and *Pinnularia nivorum* Per. (Exp. Ant. Franc., as above, Pl. I, fig. 18).

Pinnularia borealis Eh. (Text-fig. 20).—Hust. in Die Süssw. Mitt., Ht. 10, p. 326, fig. 597, (1930); Sch. At., t. 45, figs. 15–21. Synonyms: *Pinnularia latestriata* Greg., *Pinnularia chilensis* Bleisch, *Pinnularia hebridensis* Greg., *Navicula borealis* Eh. (DeToni.)

Distribution: Graham Land, South Orkneys, Cockburn Island, Cape Adare, Falkland Island, Cape Horn, Magellans, Kerguelen Island. (Antarctic records.) World-wide.

Pinnularia brevicostata Cleve. (Pl. ii, fig. 29).—Hust. in Die Süssw. Mitt., Ht. 10, p. 329, fig. 609, (1930); Sch. At., t. 43, figs. 26, 27.

The species is somewhat variable since fig. 609 (Hust.) does not agree very well with those in Schmidt's Atlas, which correspond better with the Macquarie Island type. The presence of a central gap in the costae and the straightness of the sides of the valves are the sources of the variation. This species should be compared with *Pinnularia hemiptera* K. (Sch. At., t. 43, fig. 28) and also with *Pinnularia montana* Hust. (Sch. At., t. 389, fig. 6).

Pinnularia cardinalis (Eh.) W. Sm. (Pl. ii, fig. 30).—Hust. in Die Süssw. Mitt., Ht. 10, p. 337, fig. 621, (1930); Sch. At., t. 44, figs. 1–2; W. Sm., Synops. Brit. Diat., I, p. 55, Pl. XIX, fig. 166. Synonyms: *Stauroneis cardinalis* Eh., *Stauroptera cardinalis* Eh. (DeToni.)

Distribution: World-wide.

The specimens examined were 75μ long and 12μ wide compared with 150–320μ long and 35–45μ wide. (Hustedt.)

Pinnularia divergens W. Sm. (Pl. iii, fig. 1).—Hust. in Die Süssw. Mitt., Ht. 10, p. 323, fig. 589 (1930); W. Sm., Synops. Brit. Diat., I. p. 57, Pl. XVIII, fig. 177. Synonym: *Stauroptera divergens* Kirch. (DeToni.)

Distribution: Cape Horn. (Only other antarctic record.)

Pinnularia divergentissima (Grun.) Cleve. (Pl. ii, fig. 26).—Hust. in Die Süssw. Mitt., Ht. 10, p. 320, fig. 581, (1930); Sch. At., t. 388, figs. 23, 24.

The material examined was not constricted subapically to the extent shown by Hustedt.

Pinnularia fasciata Lagerst. (Text-fig. 11).—Hust. in Die Süssw. Mitt., Ht. 10, p. 316, fig. 569, (1930).

Pinnularia interrupta ? W. Sm. (Text-fig. 9).—Hust. in Die Süssw. Mitt., Ht. 10, p. 317, fig. 573*a*, (1930); Sch. At., t. 45, figs. 67, 69, 70–72, 75, 76, 79; W. Sm., Synops.

Brit. Diat., I, p. 59, Pl. XIX, fig. 184. Synonyms: *Navicula mesolepta* Eh. var. *stauroneiformis* Grun., *Pinnularia mesolepta* var. *interrupta* W. Sm. (DeToni.)

There is considerable variety within this species principally in the disposition of the striae, Hustedt's figure having the closest affinity with the material examined in which the striae bend like ribs to the edge of the valve. In this respect the Macquarie Island specimens are quite distinct, but the variation within the species makes the erection of a new species or variety of doubtful value, especially as there appears to be no distinct boundary between this species and *Pinnularia mesolepta* (Eh.) W. Sm. (Sch. At., t. 45, fig. 62) and *Pinnularia Braunii* (Grun.) Cleve (Sch. At., t. 45, figs. 77, 78).

Pinnularia lata (Breb.) W. Sm. (Pl. iii, fig. 2).—Hust. in Die Süssw. Mitt., Ht. 10, p. 324, fig. 595, (1930); W. Sm., Synops. Brit. Diat., I, p. 55, Pl. XVIII, fig. 167; Sch. At., t. 45, figs. 5–8. Synonyms: *Frustulia lata* Breb., *Navicula pachyptera* K., *Pinnularia pachyptera* Eh., *Pinnularia megaloptera* Eh., *Pinnularia suecica* Eh., *Pinnularia pleurophora* Eh. (DeToni.)

Distribution: Graham Land, Magellans. (Antarctic records.) World-wide.

Hustedt and W. Smith show slight bulge in valve walls opposite central area. The specimens examined were identified with a slide mount prepared by West.

Pinnularia microstauron Eh. (Pl. ii, fig. 27; Pl. iii, fig. 4).—Hust. in Die Süssw. Mitt., Ht. 10, p. 320, fig. 582, (1930); Sch. At., t. 44, figs. 14, 16, 34, 35 and t. 45, figs. 31–34. Synonyms: *Stauroneis microstauron* Eh., *Stauroptera microstauron* Rab. (DeToni.)

Distribution: Falkland Island, Magellans, Kerguelen Island. (Antarctic records.) World-wide.

This species is highly variable. The Macquarie Island specimens were identified from a slide mount prepared by West, which contained a wide range of forms.

Pinnularia microstauron (Eh.) Cleve var. *Brebissonii* (K.) Hust. (Text-fig. 6).—Hust. in Die Süssw. Mitt., Ht. 10, p. 321, fig. 584, (1930). Synonyms: *Navicula Brebissonii* K., *Frustulia bipunctata* Breb., *Navicula bipunctata* Bory., *Pinnularia stauroneiformis* W. Sm., *Pinnularia Brebissonii* Rab., *Stauroptera Brebissonii* Kirch. (DeToni.)

Distribution: Europe, Norway.

Pinnularia molaris Grun. (Pl. ii, figs. 24, 25).—Sch. At., t. 44, fig. 54; Hust. in Die Süssw. Mitt., Ht. 10, p. 316, fig. 568, (1930). Synonym: *Pinnularia macra* Grun. (Schmidt.)

Distribution: Graham Land. (Only other antarctic record.)

Should be compared with *Pinnularia divergens* W. Sm. var. *sublinearis* Cleve (Sch. At., t. 44, fig. 54) and *Pinnularia leptosoma* Grun. (Sch. At., t. 388, figs. 13–15).

Pinnularia nivorum Per. var.? (Text-fig. 1).—The closest related type that could be found for these specimens was *Pinnularia nivorum* Per. (Peragallo, Diatomées d'Eau Douce, Exp. Ant. Franc., 1908–10, Bot., p. 20, Pl. I, fig. 18.) The material has therefore been placed as a possible variety of this species.

Rhopalodia O. Müller.

Rhopalodia gibberula (Eh.) O.M. var. *baltica* O.M. (Text-fig. 18).—Sch. At., t. 253, fig. 33.

Stauroneis Ehrenberg.

Stauroneis acuta W. Sm. (Pl. iii, figs. 3*a*, *b*, *c*).—Hust. in Die Süssw. Mitt., Ht. 10, p. 259, fig. 415, (1930); Sch. At., t. 241, fig. 4; W. Sm., Synops. Brit. Diat., I, p. 59, Pl. XIX, fig. 187; Prit. Inf., p. 914, t. vii, fig. 76. Synonym: *Pleurostauron acutum* (W. Sm.) Rab. (DeToni.)

Distribution: World-wide.

Stauroneis anceps Eh. var. *hyalina* Brun and Per. (Pl. iii, fig. 8).—Sch. At., t. 242, fig. 11.

In Hustedt (Die Süssw. Mitt., p. 256, fig. 408) no punctation is shown on the striae and the apices are more acute than in Schmidt's Atlas and the Macquarie Island specimens. *Stauroneis anceps* Eh. has been recorded in the antarctic from Cape Adare, Ross Island, South Victoria Land, Cape Horn and Kerguelen Island.

Stauroneis parvula (Grun.) Jan.—Hust. in Die Süssw. Mitt., Ht. 10, p. 260, fig. 417*a*, (1930). Synonym: *Pleurostauron parvulum* (Jan.) Grun.

Stauroneis pygmaea Kreiger. (Text-fig. 3).—Hust. in Die Süssw. Mitt., Ht. 10, p. 257, fig. 409, (1930).

SURIRELLA Turpin.

Surirella angustata K. (Pl. iii, fig. 5).—Hust. in Die Süssw. Mitt., Ht. 10, p. 435, figs. 844, 845, (1930); Sch. At., t. 23, figs. 39–41 (*Surirella angusta* K.). Synonyms: *Suriraya ovalis* Breb., var. *angusta* K., *Surirella apiculata* W. Sm.

Distribution: Cape Adare, Ross Island, South Victoria Land, Cape Horn. (Antarctic records.)

Surirella bifrons K. (Pl. iii, fig. 7).—Sch. At., t. 22, figs. 5, 8, 10, 11, 12 and t. 23, figs. 1, 2.

The type from Macquarie Island fits figure 12, t. 22 best. There is some variation in form with this species and it should be compared with *Surirella linearis* W. Sm. (Sch. At., t. 23, fig. 27), *Surirella saxonica* Auersw. (Sch. At., t. 22, fig. 1) and *Surirella tenera* Greg. (Sch. At., t. 23, figs. 7–9).

? *Surirella Engleri* O.M. forma *angustior* O.M. (Text-fig. 13).—Sch. At., t. 245, fig. 14.

This is a large planktonic species more than 200μ long. Its affinities with *Surirella linearis* W. Sm. are indicated in Schmidt's Atlas. Although the specimens examined are only 75–80μ long, they fit the above species very well.

SYNEDRA Ehrenberg.

? *Synedra vaucheriae* K. (Pl. iii, Fig. 6).—Hust. in Die Süssw. Mitt., Ht. 10, p. 161, figs. 192*a*-*c*, (1930); Sch. At., t. 305, figs. 18–31.

Distribution: Kerguelen Island. (Only other antarctic record.)

The determination is doubtful as only isolated frustules were found. Typical star-like aggregates were, however, observed in fresh samples. Comparison should be made with *Fragilaria intermedia* Grun.

ENVIRONMENT AND ITS EFFECT ON THE PAST AND PRESENT DIATOM FLORA OF MACQUARIE ISLAND.

The diatoms of Macquarie Is. may be considered as occurring in three major ecological environments; the soil, the water of the ponds, lakes and watercourses, and a habitat now non-existent but, as will be shown, of considerable interest and represented by the organic and diatomaceous strata of the fluvio-glacial sediments of the closing ice age.

In table I have been listed the species of diatoms and their estimated frequencies of abundance in the 10 soils already described. That there are differences between soils and varying frequencies of any one species from soil to soil is immediately clear. A closer examination reveals that five of the soils have the same dominant or co-dominant species (*Pinnularia molaris* Grun.) but that no such comparison may be applied to the remaining five. This information is presented in table V and further emphasized by table VI showing the number of species common to 1, 2, 3, . . . 10 soil habitats. Only 4 types are common to five or more soils, and of these, 3 are dominants, viz. *Pinnularia molaris* Grun., *Pinnularia Atwoodii* Per. and *Hantzschia amphioxys* Grun. Of the remaining dominant species, 4 occur in two soils, 4 occur in three soils and 3 occur in four soils, dominance in each case, however, being restricted to one habitat. The forms grouped arbitrarily as *Melosira* spp. were found only occasionally in soil no. 8 but have been used to characterize this situation. 43% of the species were found as minor constituents in single habitats.

From these observations, it is apparent that the soil, as an ecological environment, has marked effects on the size and complexity of the diatom population. In certain soils (e.g. no. 3) they form an important part of the microflora because of their photosynthetic activities and the effect of these activities on other groups of microorganisms, whilst in other soils, notably no. 6, they are practically non-existent. A full assessment

TABLE I.

The Diatom Flora of Macquarie Island Soils.

Achnanthes Biasolettiana Grun.	3 (o).	*Pinnularia Atwoodii* Per.	2 (r), 3 (o), 4 (vr), 5 (o), 7 (f).
—— *brevipes* Ag. var. *intermedia* K.	4 (vr).	—— *borealis* Eh.	1 (vr), 2 (r), 3 (c).
—— *lanceolata* Breb.	2 (vr), 3 (o), 4 (vr).	—— *brevicostata* Cleve	5 (vr).
—— *subsalsa* Peterson	4 (o), 5 (vr).	—— *cardinalis* (Eh.) W. Sm.	1 (r), 3 (vr), 5 (r), 9 (vr).
Coscinodiscus sp.	4 (vr), 7 (vr).	—— *divergens* W. Sm.	1 (vr), 3 (o).
**Cymbella pusilla* ? Grun.	3 (r).	—— *divergentissima* (Grun.) Cleve	3 (c), 5 (vr), 9 (vr), 10 (f).
Diatomella Balfouriana Grev.	1 (f), 2 (o), 3 (vr).	—— *fasciata* Lagerst.	1 (f), 3 (vr), 7 (c).
Diploneis Smithii (Breb.) Cleve	1 (vr), 2 (vr), 3 (a), 5 (vr).	—— *interrupta* ? W. Sm.	9 (f), 10 (o).
Eunotia lunaris Grun.	3 (r), 10 (a).	—— *lata* (Breb.) W. Sm.	1 (vr), 2 (o), 3 (c), 5 (c).
—— *trinacria* Krasske	3 (r), 9 (vr), 10 (a).	—— *microstauron* Eh.	1 (o), 2 (o), 3 (o), 4 (vr).
Fragilaria bicapitata A. Mayer	7 (c).	—— —— var. *Brebissonii* (K.) Hust.	9 (r).
—— *pinnata* Eh.	1 (vr), 2 (vr).	—— *molaris* Grun.	1 (r), 2 (f), 3 (f), 4 (vr), 5 (f), 8 (vr), 9 (a), 10 (a).
Fragilariopsis antarctica Castr.	2 (vr), 4 (vr), 5 (vr), 7 (vr), 9 (o), 10 (vr).	—— *nivorum* ? Per. var. ?	1 (f), 2 (r).
? Frustulia minuta Rab.	3 (o).	*Rhopalodia gibberula* O.M. var. *baltica* O.M.	3(vr).
—— *rhomboides* (Eh.) De Toni	1 (vr), 2 (vr), 3 (f).	*Stauroneis acuta* W. Sm.	1 (vr).
Gomphonema angustata (K.) Rab. var. *producta* Grun.	3 (vr).	—— *anceps*. var. *hyalina* Brun. and Per.	3 (vr).
Hantzschia amphioxys (Eh.) Grun.	1 (o), 2 (r), 3 (o), 4 (vr), 5 (o), 7 (a), 10 (f).	—— *parvula* ? (Grun.) Jan.	1 (vr).
Melosira granulata (Eh.) Ralfs	5 (r).	—— *pygmaea* Kreiger	9 (r).
—— spp.	3 (r), 8 (o), 9 (f), 10 (c).	*Surirella angustata* K.	1 (c).
Navicula mutica K.	1 (r), 4 (vr), 5 (vr).	—— *bifrons* K.	2 (vr), 3 (r).
—— (*rostellata* ? K.)	3 (vr).	? —— *Engleri* (O.M.) f. *angustior* O.M.	3 (r).
—— *seminulum* Grun.	5 (vr).	*? Synedra vaucheriae* K.	4 (o).
Neidium affine (Eh.) Cleve	1 (vr), 5 (vr).		
Pinnularia appendiculata (Ag.) Cleve.	3 (r).		

Key to symbols: a, abundant; f, frequent; c, common; o, occasional; r, rare; vr, very rare.
The numbers 1–10 refer to the soil samples (described above, p. 35) in which the species were found.

TABLE II.

The Diatom Flora of Macquarie Island Lakes and Ponds.

Achnanthes Biasolettiana Grun.	1, 5, 11.	*Melosira* spp.	1, 3, 4, 5, 6, 7, 8, 10, 11.
—— *brevipes* Ag. var. *intermedia* K.	2, 6, 8, 9.	*Navicula* (*rostellata* ? K.)	5, 10, 11.
—— *subsalsa* Peterson	6, 8, 9.	*Neidium affine* (Eh.) Cleve	5, 10, 11.
Amphora delicatissima Krasske	4, 10, 11.	*Pinnularia appendiculata* (Ag.) Cleve	1, 10.
Coscinodiscus sp.	11.	—— *Atwoodii* Per.	8, 9.
Cymatopleura solea Breb. var. *regula* (Eh.) Grun.	6.	—— *borealis* Eh.	6.
Cymbella pusilla ? Grun.	2, 5, 10, 11.	—— *brevicostata* Cleve	1, 5, 10.
Diatomella Balfouriana Grev.	2, 10, 11.	—— *cardinalis* (Eh.) W. Sm.	4.
Diploneis Smithii (Breb.) Cleve	2, 8, 10.	—— *divergens* W. Sm.	10.
Eunotia alpina K.	10, 11.	—— *divergentissima* (Grun.) Cleve	1.
—— *lunaris* Grun.	5, 10, 11.	—— *lata* (Breb.) W. Sm.	10, 11.
—— *trinacria* Krasske	5, 7, 11.	—— *fasciata* Lagerst.	10.
Fragilaria bicapitata A. Mayer	2.	—— *microstauron* Eh.	3, 6, 8, 9, 10, 11.
—— *capucina* Desm.	1, 2, 4, 6.	—— *molaris* Grun.	10, 11.
—— *pinnata* Eh.	2.	—— *nivorum* ? Per. var. ?	1.
—— *virescens* ? Ralfs	1, 5, 10, 11.	*Stauroneis anceps* var. *hyalina* Brun. and Per.	1.
Fragilariopsis antarctica Castr.	11.	*? Surirella Engleri* f. *angustior* O.M.	10.
? Frustulia minuta Rab.	5, 10, 11.	—— *bifrons* K.	5, 10.
Frustulia rhomboides (Eh.) De Toni	10, 11.	*? Synedra vaucheriae* K.	6, 7.
Gomphonema intricatum K.	2, 11.		
—— *parvulum* (K.) Grun.	3.		
Hantzschia amphioxys (Eh.) Grun.	1, 2, 4, 5, 10.		

The numbers 1–10 refer to the lakes and ponds (listed on p. 36) in which the species occur.

of the implications of these findings cannot at present be made. Our knowledge of the interbiotic relations of the various groups of soil-inhabiting organisms is most inadequate and is frequently restricted to isolated observations. Rotifers, for example, have been observed by the author apparently subsisting on soil algae growing on an artificial agar medium. This illustrates a small link in a complex food-chain which has been discussed in a most constructive manner by Birch and Clark (1953) using forest soils for their particular studies. Certain free-living nematodes are also known to be algal feeders and the author has found (unpub. results) that this group frequently occurs in large

TABLE III.

The Fossil Diatoms of the Deep Peats and Fluvio-glacial Sediments of Macquarie Island.

Species.	Peat Sample Number.
Achnanthes Biasolettiana Grun.	27*a*, *b*, *c*.
—— *brevipes* Ag. var. *intermedia* K.	9*j*, *k*, *m*, *n*, 12B3, 12B4, 12D, 18*j*, 26*k*, 27*c*, F1, F9, F10.
—— *lanceolata* Breb.	9*j*, 12B4, 12D, 18*j*, 27*b*, *c*, F1, F9.
Coscinodiscus sp.	F3.
Cocconeis placentula Eh.	9*g*, *j*, *k*, *m*.
Cymatopleura solea Breb. var. *regula* (Eh.) Grun.	12B4.
Cymbella pusilla ? Grun.	9*k*, 12D, 27*b*, *c*, F1.
Diatomella Balfouriana Grev.	9*i*, *j*, *k*, *n*, 12B3, 12B4, 12D, 18*j*, 26*j*, *k*, 27*d*.
Diploneis Smithii (Breb.) Cleve	9*g*, *j*, 26*i*, *k*, *l*, 27*b*, *c*, *d*, F1.
Eunotia trinacria Krasske	12D.
Fragilaria capucina Desm.	9*m*, 12D.
—— *Harrisonii* (W. Sm.) Grun.	9*g*, *j*, *k*, *m*, *n*, 12B3, 12B4, 12D, 18*j*, 26*l*, 27*b*, *c*.
—— *pinnata* Eh.	9*g*, *i*, *j*, *k*, *m*, *n*, 12B4, 12D, 18*j*, 26*l*, 27*c*.
—— *virescens* Ralfs	9*g*, *i*, *j*, *k*, *m*, *n*, 12B3.
—— *virescens* ? Ralfs	9*m*, 12B4, 12D, 18*j*, 26*k*, *l*, 27*a*, *b*, *c*, *d*, F1, F2, F3.
Fragilariopsis antarctica Castr.	9*i*, *j*, *k*, *n*, 18D, 26*j*, *k*, 27*a*, *b*, F3.
Frustulia rhomboides (Eh.) De Toni	26*k*, 27*c*.
Gomphonema angustatum (K.) Rab. var. *producta* Grun.	9*g*, *j*, *k*, 12B4, 12D.
—— *intricatum* K.	9*g*, *k*, *m*, *n*, 12B4, 12D, 18*j*, 27*b*, *c*, *d*, F1, F3, F10.
—— *parvulum* (K.) Grun.	9*g*-*n*, 12B3, 12B4, 12D, 27*c*, F1, F3, F10.
Hantzschia amphioxys (Eh.) Grun.	12B4, 12D, 26*l*, 27*b*, *c*, F1.
Melosira spp.	9*i*-*n*, 12B3, 12B4, 12D, 18*j*, 26*j*, *k*, 27*a*, *c*, F1–9.
Navicula mutica K.	9*g*, 12B4.
Neidium affine (Eh.) Cleve	12B4, 12D.
Opephora Martyi Heribaud	9*g*, *k*, *m*, *n*, 12D, 27*a*.
Pinnularia brevicostata Cleve	12B4, 12D, 27*a*.
—— *cardinalis* (Eh.) W. Sm.	12B4, 12D, 18*j*, 26*k*, *l*, 27*b*, *c*.
—— *divergens* W. Sm.	12B4, 12D, 26*l*, F1.
—— *lata* (Breb.) W. Sm.	9*i*, *j*, *n*, 12B4, 12D, 18*d*, 26*k*, 27*a*.
—— *microstauron* Eh.	9*g*, 12B3, 12B4, 12D, 18*d*, *e*, *f*, 26*l*, 27*b*, *c*, *d*, F1, F3, F9.
—— *molaris* Grun.	F1, F3, F10.
Rhopalodia gibberula var. *baltica* O.M.	26*k*, *l*.
Stauroneis acuta W. Sm.	9*i*, *k*, 12B4, 26*k*, *l*, 27*b*, *c*, *d*.
—— *anceps* var. *hyalina* Brun. and Per.	12B4, 12D, 18*j*, 26*l*, 27*a*, *b*, *c*.
Surirella bifrons K.	26*k*.
? —— *Engleri* (O.M.) f. *angustior* O.M.	26*k*.
? *Synedra vaucheriae* K.	12D.

The numbers refer to the samples from the fluvio-glacial deposits listed on p. 36.

numbers in the soils of Macquarie Is. The ultimate effect of such relationships on the soil and thence on the growth of higher plants rests with bacterial decomposition. Should a particular group, such as the diatoms, be prominent, this provides, in itself, a ready source of energy for bacteria but this food source may not undergo direct decomposition, being diverted to other channels such as nematodes so that the eventual composition of the soil organic matter is affected, depending on the nature and complexity of the food chain or path of breakdown.

The influence of soil conditions is complex and there is sufficient variation in the soils examined, both physically and chemically, to explain in some part, the differences in the diatom floras. Variations in local climate are also important partly from the

TABLE IV.

List of Antarctic Diatoms.

Achnanthepyla Bongrainii Per.	1.
—— *Gainii* Per.	1.
Achnanthes antarctica Per.	1.
—— *affinis* Grun.	13.
—— *australis* Eh.	11.
—— *Biasolettiana* Grun.	7, 8, 10, 13.
—— *brevipes* Ag. var. *intermedia* K.	4, 6, 13.
—— *Charcotii* Per.	1.
—— *coarctata* Grun. var. *eliminata* Lag. f. *antarctica* Per.	1.
—— (*coarctata* var. ?) *distorta* Per.	1.
—— *exigua* Grun.	10, 13.
—— *exilis* K.	12, 13.
—— *hungarica* Grun.	9.
—— *inflata* Grun.	3, 7.
—— *lanceolata* Breb.	13.
—— *linearis* Grun.	10, 13.
—— *minutissima* K. var. *cryptocephala* Grun.	13.
—— *muscorum* Per.	1.
—— —— var. *minor* Per.	1.
—— *Semen* Eh.	7, 8.
—— *subsalsa* Peterson	13.
Amphora gracilis Eh.	12.
—— *hyalina* Eh.	7.
—— *libyca* Eh.	7, 8.
—— *ovalis* K.	2.
—— —— var. *gracilis* V.H.	3, 11.
—— —— —— *pediculus* V.H.	10.
—— *delicatissima* ? Krasske	13.
Amphiprora minor Greg.	12.
—— *parva* Reinsch	12.
Amphiprora Pockornyana Grun.	12.
Biddulphia arcticum Brightw.	6.
—— sp.	2.
Campylodiscus magnus Reinsch	12.
Cocconeis borealis Eh.	11.
—— *costata* Greg.	2.
—— —— var. *imperatrix* (Eh. ?)	3.
—— —— var. *pacifica* Eh.	3.
—— *litigiosa* V.H.	6.
—— *placentula* Eh.	7, 13.
—— —— var. *lineata* V.H.	8.
—— *striata* Eh. (*Diploneis elliptica ?*)	7, 8, 11.
Coscinodiscus decipiens Grun.	4.
—— *griseus* Grev.	4.
—— *lacustris* Grun.	4.
—— *lentiginosus* Jan.	6.
—— *radiatus* Eh.	2.
? Coscinodiscus sp.	13.
Cyclotella comta K.	1.
—— *Meneghiniana* K. var. *plana* Fritsch	1.
—— *operculata* K.	4.
Cymatopleura solea W. Sm.	1.
—— —— Breb. var. *regula* (Eh.) Grun.	13.
Cymbella americana A. Sch.	9.
Cymbella antarctica Cleve	10.
—— *aspera* Eh.	10.
—— *cistula* Kirch.	1.
—— *cuspidata* K.	9.
—— *cymbiformis* Ag.	1.
—— *Ehrenbergii* K.	8, 9.
—— *gastroides* Eh.	12.
—— *lanceolata* Kirch.	1.
—— *microcephala* Grun.	10.
—— *naviculaeformis* Auers.	10.
—— *pusilla* Grun.	6, 13 (?).
—— *spuria* Cleve	10.
Diatoma anceps Kirch.	1.
—— *Ehrenbergii* K. var. *grande* J. Br.	7, 8, 11.
—— *elongatum* Ag.	4.
—— *grande* W. Sm.	14.
—— *rhombicum* O'M.	14.
Diatomella Balfouriana Grev.	13.
Diploneis elliptica Cleve	9, 10.
—— *ovalis* var. *oblongella* Cleve	1.
—— *Smithii* (Breb.) Cleve	13.
Denticula tenuis K. var. *antarctica* Fritsch	4.
—— *thermalis* K. var. *minor*	12.
Encyonema gracilis Rab.	10.
—— *lunula* Grun.	9.
Epithemia sorex K.	1.
—— *turgida* K.	1.
—— —— var. *zebrina* Rab.	7.
—— *zebra* K.	1, 7.
—— —— f. *minor* V.H.	1.
Eunotia alpina K.	10, 13.
—— *arcus* Eh.	8, 10, 11.
—— —— var. *hybrida* Grun.	9.
—— *attenuata* Cleve	10.
—— *Camelus* Eh.	8.
—— *Cygnus* Eh.	11.
—— *exigua* Rab.	10.
—— *Falklandiae* Eh.	7.
—— *gracilis* W. Sm.	2, 8.
—— *impressa* Eh.	11.
—— *incisa* Greg.	10.
—— *lunaris* Grun.	1, 13.
—— *major* Rab.	10.
—— *monodon* Eh.	11.
—— *obesa* Cleve	9.
—— *obtusiuscula* Cleve	9.
—— *parallela* Eh.	8, 9.
—— *pectinalis* Dilwyn	12.
—— —— Rab. var. *stricta* Rab.	9.
—— *quaternaria* Eh.	8.
—— *robusta* Ralfs	9.
—— —— var. *papilio* Rab.	9.
—— *ternaria* Cleve	10.
—— *tridentata* Eh.	10.
—— *tridentula* Eh.	1, 8, 10.
—— —— var. *ventricosa* Per.	1.
—— *trinacria* Krasske	13.
—— *triodon* Eh.	1.
Fragilaria bicapitata A. Mayer	13.
—— *capucina* Desm.	7, 13, 14

The numbers refer to the following records: 1. Peragallo, 1908, Graham Land; 2. Fritsch, South Orkneys; 3. Hooker, Ehrenberg, Cockburn Island; 4. Fritsch, 1901–4, Cape Adare; 5. Fritsch, 1910, Cape Adare; 6. W. and G. S. West, 1907–9, Ross Island, South Victoria Land; 7. Ehrenberg, Falkland Island; 8. Ehrenberg, Cape Horn; 9. Petit, Cape Horn; 10. Cleve, Magellans; 11. Ehrenberg, Kerguelen; 12. Reinsch, 1874–9, Kerguelen; 13. Bunt, Macquarie Island; 14. O'Meara, Marion Island.

TABLE IV.—*Continued.*

List of Antarctic Diatoms.—Continued.

Fragilaria construens Grun.	8.
—— *curta* V.H. ..	4.
—— *Eunotia* Eh. ?	8.
—— *Harrisonii* (W. Sm.) Grun.	13.
? —— *linearis* Castr.	4.
—— *mutabilis* Grun.	9.
—— *obliquecostata* V.H.	4, 6.
—— *pinnata* Eh.	13.
—— *tenuicollis* Heib.	4.
—— —— var. *antarctica* W. & G. S. West	6.
—— *virescens* Ralfs.	6, 13
—— *virescens* ? Ralfs	13.
Fragilariopsis antarctica Castr.	13.
? *Frustulia minuta* Rab.	13.
Frustulia rhomboides (Eh.) De Toni	13.
Gomphonema angustatum (K.) Rab. var. *producta* Grun.	13.
—— *bicapitatum* O'M.	14.
—— *augur* Eh.	11.
—— *auritum* Braun.	10.
—— *Brebissonii* K.	12.
—— *catena* Eh.	7.
—— *constrictum* Eh.	1.
—— *dichotomum* K.	9.
—— *gracile* Eh.	7, 11.
—— *intricatum* K.	13.
—— *Kamtschaticum* Grun. var. *antarctica* Per.	1.
—— *longiceps* Eh.	11.
—— *montanum* Schum.	2.
—— *Mustela* Eh.	9.
—— *parvulum* (K.) Grun.	13.
Hantzschia amphioxys (Eh.) Grun.	3, 4, 6, 7, 8, 13.
—— —— var. *brasiliana* Grun. f. *minor*	1.
—— —— var. *capensis* Grun.	1.
—— —— var. *minor* Per.	1.
—— —— var. *uticensis* Grun.	1.
—— —— var. *xerophila* Grun.	1.
—— (—— var. ?) *antarctica* Per.	1.
—— *elongata* Grun.	4, 6, 10, 11.
Hemiaulus ambiguus Jan.	6.
Larirella diaphana Bleisch	12.
Mastogloia imperfecta Cleve	10.
Melosira crenulata K.	1.
—— —— var. *lavis* Grun.	8.
—— *Dickiei* K.	1.
—— *distans* (Eh.) K.	6.
—— *granulata* (Eh.) Ralfs	13.
—— *Roseana* Rab.	1.
—— *setosa* Grev.	1.
—— *sol* K.	2.
—— *varians* Ag.	2, 6.
—— spp.	4, 5, 13.
Navicula aequalis Eh.	7, 11.
—— *affinis* Eh.	7, 8.
—— *amphirhynchus* Eh. fs. *minor* and *major*	10.
—— *amphisbaena* Bory	8, 11.
—— *amphisphenia* Eh.	8.
Navicula antarctica (Eh.) De Toni	11.
—— *Atomus* Grun.	10.
—— *australis* Eh.	8.
—— *bacillum* Eh.	7, 8, 10.
—— *bisulcata* Lag.	1.
—— *Boudeti* Per.	1.
—— *brachysira* Breb.	10.
—— *carassius* Eh.	14.
—— *Charcotii* Per.	1.
—— *Charlatii* Per.	1.
—— *chiliensis* K.	11.
—— *completa* Cleve	10.
—— *crassinervia* Breb.	9.
—— *curta* Per.	1.
—— *curta* Per. var. *elongata* Per.	1.
—— *cuspidata* K.	7.
—— *cymatopleura* W. & G. S. West	4, 6.
—— *Dactylus* K.	9.
—— —— var. ?	9.
—— *decurrens* Eh.	7, 8.
—— *dicephala* Eh.	5, 7, 11, 12.
—— *elliptica* K. var. *cocconeides* Rab.	12.
—— *ergadensis* Ralfs	9.
—— *Falklandiae* Eh.	7.
—— *Gastrum* Eh.	7, 11.
—— *glaberrima* W. & G. S. West	6.
—— *Godfroyi* Per.	1.
—— *hungarica* Grun. var. *capitata* Eh.	3, 8.
—— *icostauron* Grun.	11.
—— *Kerguelensis* (Eh.) Ralfs	11.
—— *latevitata* Cleve	10.
—— *leptogongyla* Eh.	7.
—— *limosa* K.	7, 10.
? —— *lucidula* Grun.	2.
—— *Magellanica* Cleve	10.
—— *microsphenia* Eh.	7.
—— *minima* Grun.	1.
—— *minutissima* Grun.	12.
—— *muralis* Grun.	1.
—— *murrayi* W. & G. S. West	4, 5, 6.
—— —— var. *elegans* W. & G. S. West	4, 5, 6.
—— *mutica* K.	1, 2, 13.
—— —— var. *sporangialis* Per.	1.
—— —— var. *capitulata* Per.	1.
—— —— var. *cymbelloides* Per.	1.
—— —— var. *truncata* Per.	1.
—— —— var. *ventricosa* Cleve	1.
—— *muticopsiforme* W. & G. S. West	4, 5, 6.
—— *muticopsis* V.H.	1, 2, 4, 5, 6.
—— —— var. *capitata* Per.	1.
—— *neglecta* K.	7.
—— *nobilis* K.	7.
—— *peraustralis* W. & G. S. West	6.
—— *peregrina* K.	3, 11.
—— *perlepida* Grun.	6.
—— *pisiculus* K.	9.

The numbers refer to the following records: 1. Peragallo, 1908, Graham Land; 2. Fritsch, South Orkneys; 3. Hooker, Ehrenberg, Cockburn Island; 4. Fritsch, 1901–4, Cape Adare; 5. Fritsch, 1910, Cape Adare; 6. W. and G. S. West, 1907–9, Ross Island, South Victoria Land; 7. Ehrenberg, Falkland Island; 8. Ehrenberg, Cape Horn; 9. Petit, Cape Horn; 10. Cleve, Magellans; 11. Ehrenberg, Kerguelen; 12. Reinsch, 1874–9, Kerguelen; 13. Bunt, Macquarie Island; 14. O'Meara, Marion Island.

TABLE IV.—*Continued.*

List of Antarctic Diatoms.—Continued.

Navicula platalea Eh.	8.
—— *platystoma* Eh.	8.
—— *pleuronoctes* Eh.	8.
—— *producta* W. Sm.	9.
—— *pterophaena* (Eh.) De Toni	11.
—— *quinquenodis* Grun.	1.
—— *radiosa* K.	6, 10.
—— —— var. *acuta* Grun.	7.
—— *rhomboides* (Eh.) (*Vanheurckia*)	9, 10.
—— —— var. *amphipleuroides*	10.
—— *rhyncocephala* K. f.	6.
—— (*rostellata* ? K.)	13.
—— *Semen* Eh.	7.
—— *semicruciata* A. Sch.	9.
—— *seminulum* Grun.	4, 13.
—— *serians* K.	10.
—— *Shackletoni* W. & G. S. West	4, 6.
—— —— var. *pellucida* W. & G. S. West	4, 6.
—— *sphaerophora* K.	10.
—— *streptoraphe* Cleve var. *styliformis* Cleve	7.
—— *subcapitata* Greg. var. *stauroneiformis* Pet.	1.
—— *subtilissima* Cleve	10.
—— *tabellaria* K.	7 (?), 11.
—— *transversa* A. Sch.	9.
—— *vespa* Eh.	11.
—— sp.	12.
Neidium affine (Eh.) Cleve	13.
Nitzschia Frauenfeldii var. *antarctica* Per.	1.
—— *frustulum* Grun.	10.
—— *palea* W. Sm.	1.
—— *subtilis* (K.) Grun. var. (*glacialis* or *paleacea*) Grun.	6.
Odontidium hyemale Lyng.	12 (O'Meara).'
Opephora Martyi Heribaud	13.
Pinnularia appendiculata (Ag.) Cleve	1, 7, 8, 13.
—— *Atwoodii* Per.	13.
—— *borealis* Eh.	1, 2, 3, 4, 7, 8, 9, 10, 11, 13.
—— —— var. *dilatata* Eh.	7, 8, 11.
—— *Braunii* Grun.	2.
—— *brevicostata* Cleve	13.
—— *Brebissonii* K.	1, 9.
—— —— var. *diminuta* V.H.	2.
—— *cardinalis* (Eh.) W. Sm.	13.
—— *Depauxii* Per.	1.
—— *divergens* W. Sm.	9, 13.
—— —— var. *elliptica* Grun.	10.
—— *divergentissima* (Grun.) Cleve	13.
—— *gibba* K.	7, 8, 10, 11.
—— *globiceps* Greg.	4, 6.
—— *fasciata* Lagerst.	13.
—— *intermedia* Lagerst.	1.
—— —— var. *antarctica* Per.	1.
? —— *interrupta* W. Sm.	13.
—— *lata* (Breb.) W. Sm.	1, 10, 13.
—— —— var. *integra* Per.	1.
—— —— var. *minor* Grun.	1.
Pinnularia Legumen Eh.	7, 9, 11.
—— *macilenta* Eh.	7, 8, 9, 11.
—— *major* K.	9, 10.
—— *mesolepta* Eh.	9.
—— *microstauron* Eh.	7, 10, 11, 13.
—— —— var. *Brebissonii* (K.) Hust.	13.
—— *molaris* Grun. (*P. macra* Grun.)	1, 13.
—— *nivorum* Per.	1.
—— —— var. ?	13.
—— —— var. *elongata* Per.	1.
—— *nodosa* Eh.	9.
—— *stauroneiformis* Per.	1.
—— *stauroptera* Grun.	10.
—— *stauropteroides* Fritsch	4.
—— *Thiebaudi* Per.	1.
—— *viridis* K.	7, 8, 9, 10, 11, 12.
—— —— var. *commutator* Grun.	9, 10.
—— *viridula* W. Sm.	12.
—— spp. (Eaton, Reinsch)	12.
Rhoikoneis interrupta Per.	1.
Rhoicosphenia curvata Grun.	10.
Rhopalodia gibba O. Muell.	1, 10.
—— *gibberula* (Eh.) O.M. var. *baltica* O.M.	13.
—— *ventricosa* O.M.	1.
Stauroneis acuta W. Sm.	13.
—— *amphilepta* Eh.	10.
—— *anceps* Eh.	4, 6, 9, 12.
—— —— var. *birostris* Eh.	7, 11.
—— —— var. *hyalina* Brun. and Per.	13.
—— *goeppertiana* Bleisch	12.
? —— *parvula* (Grun.) Jan.	13.
—— *phoenicenteron* Eh.	7, 8, 9, 11, 12.
—— —— var. *gracilis* J.B. & Per.	7, 8, 11.
—— *Semen* Eh.	7, 11.
—— *pygmaea* Kreiger	13.
Stenopterobia anceps Breb.	10.
Surirella angustata K.	4, 6, 9, 13.
—— *bifrons* K.	13.
—— *constricta* Eh.	9.
? —— *Engleri* (O.M.) f. *angustior* O.M.	13.
—— *euglypta* Eh.	7.
—— *Falklandiae* Eh.	7.
—— *Guatamalensis* Eh.	10.
—— *insularum* Eh.	7.
—— *linearis* W. Sm.	10.
—— *Maluinensis* Eh.	7.
—— *microcora* Eh.	7.
—— *splendida* Eh.	7.
—— —— var. *tenera* Greg.	10.
—— *striatula* Turp.	7.
Synedra vaucheriae K.	12.
? *Synedra vaucheriae* K.	13.
Synedra sp.	2.
Tabellaria flocculosa (Roth.) K.	6.
Trachyneis aspera (Eh.) Cleve	6.
Tropidoneis laevissima W. & G. S. West	6.

The numbers refer to the following records: 1. Peragallo, 1908, Graham Land; 2. Fritsch, South Orkneys 3. Hooker, Ehrenberg, Cockburn Island; 4. Fritsch, 1901–4, Cape Adare; 5. Fritsch, 1910, Cape Adare; 6. W. and G. S. West, 1907–9, Ross Island, South Victoria Land; 7. Ehrenberg, Falkland Island; 8. Ehrenberg, Cape Horn; 9. Petit, Cape Horn; 10. Cleve, Magellans; 11. Ehrenberg, Kerguelen; 12. Reinsch, 1874–9, Kerguelen; 13. Bunt, Macquarie Island; 14. O'Meara, Marion Island.

direct effect exerted, such as percentage of time the ground is frozen and duration of each freeze, and partly from the type of vegetation occurring in any given area and, at Macquarie Is., this depends principally on exposure to wind. The type of plant community, under these conditions, largely influences the type of soil which develops.

It has already been noted that *Pinnularia molaris* Grun. is a dominant species in soils 2, 3, 5, 9 and 10 which are in many respects dissimilar. This diatom is clearly an adaptable type, since it also appears as a minor constituent in three other soils. Its

TABLE V.

Diatoms Dominant in Ten Macquarie Island Soils.

Soil Number.	Dominant Species.
1	*Diatomella Balfouriana* Grev., *Pinnularia fasciata* Lagerst., *Pinnularia nivorum* Per. var. ?
2	*Pinnularia molaris* Grun.
3	*Diploneis Smithii* (Breb.) Cleve, *Frustulia rhomboides* De Toni, *Pinnularia molaris* Grun.
4	*Achnanthes subsalsa* Peterson.
5	*Pinnularia molaris* Grun., *Pinnularia leta* (Breb.) W. Sm.
6	None.
7	*Hantzschia amphioxys* (Eh.) Grun., *Pinnularia Atwoodii* Per.
8	*Melosira* spp.
9	*Pinnularia molaris* Grun., *Pinnularia interrupta* W. Sm., *Melosira* spp.
10	*Eunotia lunaris* Grun., *Eunotia trinacria* Krasske, *Pinnularia molaris* Grun.

absence from soil no. 6 may be explained mainly by the relative lack of moisture and from soil no. 7 by the undoubted salinity of this situation on rocks constantly receiving sea spray. For many of the other species an explanation of the distribution patterns may not be so simple for, unlike the vascular flora which is controlled by fairly readily definable factors, chiefly exposure to wind and position of water table, the number of controlling variables is large and frequently cannot be measured. In this connection

TABLE VI.

Distribution of Diatoms in Macquarie Island Soils.

Number of Soil Environments.	Number of Species.
1	20
2	9
3	7
4	6
5	1
6	1
7	1
8	1
9 and 10	—

one should mention several factors discussed by Pringsheim (1950), viz. the possible influence of simple competition by other organisms in the same environment for available nutrients and the not uncommon production of antibiotic substances by many of these organisms to which some algae are susceptible. Certain instances of antibiotic activity in soil, once subject to doubt by some workers, have been quoted by Stevenson and Lochhead (1953) and many of the fungi from Macquarie Is. produce these substances. Furthermore, some algae are more or less dependent on growth substances and

vitamins which may be produced and excreted by other microorganisms so that complete autotrophism is not an invariable characteristic of this group. Such factors should be included with the more commonly considered effects of pH, salinity, etc.

Table II lists the species of diatoms found in samples from the ponds, lakes and watercourses of the island. The general distribution pattern shown in Table VII agrees rather well with that for the soils. Only three species were found common to 5 or more habitats and 36% were recorded from single situations. The greatest variability occurs in the ponds of the raised coast terrace sub-glacial herbfields, but certain affinities were apparent in the remaining samples examined. Of the 9 species found in a plateau creek (sample no. 2), 5 occur in Prion Lake; the 12 species in the small lake (sample no. 5) all occur in Prion Lake, the bottom mud of which contained only 4 more species than a sample taken in shallow water near the shore. The two samples (nos. 8 and 9) from ponds in the wet tussock grassland contained few species, four of which were common to both habitats.

TABLE VII.

Distribution of Freshwater Diatoms.

Number of Freshwater Environments.	Number of Species.
1	15
2	9
3	11
4	4
5	1
6	1
7 to 8	—
9	1
10 to 11	—

The factors influencing the growth of diatoms in water are probably somewhat different from those which apply in soil. The characteristics of the waters sampled showed considerable variation. Within the sub-glacial herbfields of the coast one finds a range of water environments including muddy, foul-smelling stagnant ponds supporting a dense and complex population of microorganisms (often dominated by purple and filamentous sulphur bacteria), clear almost stagnant pools of varying size rich in algae and water-tolerant or hydrophilic vascular plants such as *Callitriche antarctica* and *Ranunculus biternatus* and small, slow-flowing, ill-defined freshwater runners passing as surface drainage from the inland edge of the herbfields to the sea. Thus, at one extreme, one might expect the complexity of a soil environment and at the other situations in which factors such as oxygen tension, pH and simple nutrient supply are of greatest importance.

The simplicity of the diatom flora found in the small, stagnant pools of the wet tussock grassland is probably influenced to a large extent by the saline conditions existing so close to the sea. A sample of rain water collected in this vicinity was found to contain 0·88 gm. of NaCl/litre. As yet, little is known of the limnology of the plateau lakes. Geologically there are several types; water-filled deep rock-basins of glacial origin such as Prion Lake, small tarns and rather more extensive ponded depressions such as Island Lake. These bodies of water do not always have outlets (e.g. Prion Lake) and are frozen over during the winter. The ecological environment, then, exhibits a certain diversity. Prion Lake, which was investigated briefly by Lindholm, Jerums and the author in February 1952, is more than 100 feet deep near the centre, with steep walls and a narrow bench platform to which most of the scant plant life is restricted. The bacterial content is low, the summer temperature of the surface is 6°–8°C. and the pH close to 7·0. 0·068 gm. of chlorides was recorded from Scobles Lake

further to the north. Copepods were the only prominent animal organisms taken in plankton hauls. The climatic peculiarities of the island are considered to be the chief factors limiting a wider diversity amongst the diatoms (and other forms of life) of the lakes since the biosphere is limited largely to the shallow water where the physical environment is more or less uniform in every body of water, small or large, on the plateau. This view may require revision if a full-scale limnological programme is undertaken at a later date.

In the fluvio-glacial sediments, differences such as occur in the soil and water are not so apparent. The species recorded are listed in table III and it will be seen from table VIII that 10 of the 37 species occur in 10 or more of the strata examined. This points to a greater uniformity of conditions at the time the sediments were being formed than exists today. Of greater significance, however, are several differences between what may be designated the old and the new floras, viz. the absence particularly of *Fragilaria Harrisonii* (W. Sm.) Grun. and *Fragilaria virescens* Ralfs, but also of *Cocconeis placentula* Eh.[1] from the present-day flora, whereas the former two species were abundant and widespread at the close of the last ice age. They were not found in

TABLE VIII

Distribution of Diatoms in the Fluvio-glacial Sediments.

Number of Strata.	Number of Species.	Number of Strata.	Number of Species.
1	6	9	1
2	5	10	1
3	3	11	2
4	2	12	1
5	2	13	4
6	2	14	1
7	3	19	1
8	3		

the deep peat of the raised coast terrace which has been uplifted and colonized in comparatively recent times. It is difficult to postulate a satisfactory explanation for the disappearance of these once prominent forms since 33 of the 37 fossil species still constitute part of the flora. It might be suggested that the conditions which once favoured their growth no longer prevail and yet this seems rather unusual when one considers the severity of the past climate, and that *Fragilaria virescens* Ralfs has been found at Ross Is. (antarctica). Further, both species have been described from Europe which would indicate tolerance to a wide range of conditions.

Another possibility is that some intervening process or event has caused their extinction. The strata examined all underlie gravelly sediments of varying thickness which may indicate a further brief period of glaciation or an extremely wet period accompanied by very active erosion. Both might have been sufficient to bring about a marked alteration or even elimination of the diatom flora. Why then should two of the most prominent species be lost? In the event of complete extinction, which seems doubtful, it does not seem likely that practically the same flora should be reintroduced by such a haphazard agency as wind or even flying birds with fixed migratory habits, which should not be ignored as carriers.

In any event the dominant flora has changed in a striking fashion and the possibility of similar changes in the vascular flora should not be overlooked by workers in that field, already investigated hypothetically by Cheeseman (1919), Rudmose Brown (1912) and others.

Finally, some comparison must be made between the diatom floras of the three major environments. A total of 46 species was found in the soil, 43 in the water and 37

[1] The author has since found this species in a single sample from a lake on the plateau.

in the old sediments. Twenty-five species were common to all three environments. The marked similarity between the soil and freshwater floras is a clear reflection, partly of the high water status of the soils and partly of the relative lack of diversity of species in the freshwater environments, and shows that an ecological grouping of the species such as has been suggested by Petersen (1935) would be of little value under the conditions existing at Macquarie Island.

The Affinities, Distribution and Origin of Terrestrial Diatoms in Antarctic and Subantarctic Regions.

Table IV, which lists the species recorded from subantarctic islands and the antarctic mainland, is summarized in table IX. About 340 species and varieties comprising 43 genera are included. Fifteen genera are represented by only one species each, 15 by 2–5 species, 3 by 6–10 species and 10 by 11 or more species. From the information in table X it will be seen that there are no major affinities between the diatom floras of

Table IX.

Statistics of the Species and Genera of Diatoms Recorded in the Antarctic.

Geographic Location.	Number of Species and Varieties.	Number of Species.	Number of Genera.	Number of Species and Varieties not Recorded Elsewhere.
Graham Land	74	54	17	61
South Orkneys	15	15	10	11
Cockburn Island	8	7	5	2
Cape Adare	29	27	12	13
Ross Island and South Victoria Land	32	30	17	18
Falkland Islands	51	49	13	20
Cape Horn	68	63	16	36
Magellans	54	52	17	34
Kerguelen Island	56	53	17	30
Macquarie Island	60	59	24	41
Marion Island	5	5	4	4
Bouvet Island	1	1	1	—
South Georgia	19	19	10	—

the various zones explored. Only five species are common to Macquarie Is. and Cape Adare and South Victoria Land immediately to the south. Eight species are common to the Magellans and Falkland Is. and 4 species are common to the Magellans and Graham Land. These slight affinities could well be explained by chance in view of the overriding differences which exist in the records.

The reason for this situation must be sought in the methods by which diatoms have been introduced to these relatively isolated environments. The principal agent is believed to be wind, for, although migratory birds must also be regarded of some importance, the lack of affinity existing between the species at the various stations implies the more accidental process of aerial dissemination. Hooker (1843) recorded diatoms in dust collected aboard ship off the Cape Verde Islands and Chapman and Grayson described 23 species in "red rain" at St. Kilda, Victoria, in 1903. More recently van Overeem (1937) and Polunin and Kelly (1952) have collected by direct methods the living spores of various organisms carried by air currents in the upper atmosphere. Many of the species recorded on the antarctic mainland appear not to be part of the living population but air-borne frustules which have been deposited and preserved in the ice.

It is clear, then, that with wind as the principal agent of introduction, few affinities could be expected since a great number of species appear to be capable of successful

growth under the severest conditions. The resistance of these organisms to partial desiccation during transport is probably an important factor influencing survival. It is also reasonably certain that the present diatom floras are more or less stable and have been long established in their various environments. This is indicated partly by the presence of local varieties which are not found in other situations. *Achnanthes brevipes* Ag. var. *intermedia* K., for example, a species common on Macquarie Is., has been shown to possess certain minor characteristics which distinguish it from the same organism occurring elsewhere. Similar cases are quite common in the literature. It is shown further by the comparative lack of diversity of the recorded lists of species and by the fact that there has not been a very great increase in the number of species on Macquarie Is. since the close of the last ice age. Also the improbability of a newly-introduced species competing successfully in an already well-developed community is well recognized. The nature of the climate, of course, is a further limiting factor.

TABLE X.

Distribution of Diatoms in Antarctic Regions.

Number of Areas.	Number of Species.
1	224
2	43
3	16
4	9
5 or more	3

It should be mentioned here that some of the collections from subantarctic islands are believed not to be complete. Those from Marion and Bouvet Islands are obviously only isolated records, but Kerguelen is a larger island than Macquarie, with a slightly more favourable climate and offers a much wider range of environments and yet only 56 species and varieties have been identified. A similar situation applies to the Falklands and Magellans which have a further advantage in their close connection with South America.

Finally, some mention should be made of the differences which exist between the diatoms of the arctic and antarctic. Mann (1937) has explained the reasons for the greater complexity of marine forms in the antarctic than in the arctic by the openness of the Southern Ocean and its connections with the other large oceans of the world. A somewhat similar argument may be applied in reverse for the terrestrial diatoms. Most land masses in the antarctic and subantarctic are extremely isolated. This is not so in the arctic. Further, the climate in southern latitudes is far more severe (Cheeseman, 1919) than in the north and it is the combination of these two factors, severe climate and geographic isolation, that may be held responsible for the paucity of the diatom floras in these southerly regions.

Acknowledgements.

The author wishes to express his appreciation for the continued financial support of A.N.A.R.E. since his return to Australia in 1952 and for the permission which was given to return to Macquarie Island during the 1953 change-over operations. His thanks are also due to the University of Sydney for provision of laboratory facilities in the Faculty of Agriculture, to Mr. J. M. Vincent for criticism of the manuscript and to Mr. B. W. Taylor, A.N.A.R.E. biologist, for making available samples of freshwater algae. Finally, he wishes to record his thanks for the helpful advice and assistance given by Professor L. M. Baas Becking, Mr. E. J. Ferguson-Wood and Mr. L. Crosby of the Fisheries Division of C.S.I.R.O. at Cronulla, New South Wales.

Bibliography.

BIRCH, L. C., and CLARK, D. P., 1953.—Forest Soil as an Ecological Community, with special reference to the fauna. *Quart. Rev. Biol.*, 28, 1 : 13-36.

CHAPMAN, F., and GRAYSON, H. J., 1903-4.—On "red rain", with special reference to its occurrence in Victoria. With a note on Melbourne dust. *Vict. Naturalist*, 20 : 17.

CHEESEMAN, T. F., 1919.—The Vascular Flora of Macquarie Island. *Australasian Antarctic Expedition—1911-14.* Scientific Reports, Series C.—Zool. and Bot., VII, 3.

CLEVE, T. P., 1900.—Expédition Suédoise au détroit de Magellan, sous les ordres de Nordenskiold. Incomplete reference from Peragallo, 1921.

DETONI, B., 1891-4.—Sylloge Algarum omnium hucusque cognitarum, II, Bacillarieae.

EHRENBERG, E. C., 1854.—Mikrogeologie (Leipzig) p. 2, t. XXXV, A.I., p. 262, t. XXXV, A.II, pp. 287-9.

FRITSCH, F. E., 1911.—Fresh water algae collected in the South Orkneys by Mr. R. N. Rudmose Brown of the Scottish National Antarctic Expedition, 1902-4. *J. Linn. Soc. Bot.*, XL : 293-338.

————, 1912.—Fresh Water Algae. *National Antarctic Expedition, 1901-4.*. Natural History, VI.

————, 1917.—Fresh Water Algae. *British Antarctic Expedition, 1910.* Botany, Pt. I, pp. 1-16.

GREGORY, W., 1855.—On a remarkable group of diatomaceous forms, with remarks on shape or outline as a specific character. *Trans. Mic. Soc. London*, 3 : 10-15.

HENDEY, N. INGRAM, 1937.—The plankton diatoms of the southern seas. *Discovery Reports*, V, XVI : p. 332.

HOLMBOE, J., 1902.—*Navicula mutica* K., aus dem antarktischen Festlande. *Nyt Mag. f. Naturvidenskab*, XL : pp. 209-222, pls. 3-4.

HOOKER, J. D., 1839-43.—The Botany of the Antarctic Voyage of H.M. Discovery Ships "Erebus" and "Terror". (Flora Antarctica.) Algae (by W. H. Harvey and J. D. Hooker). Vol. I, pp. 175-193 (1845) ; Vol. II, pp. 454-519 (1846-7).

HUSTEDT, F., 1930?.—in Rabenhorst's Kryptogamenflora, Bd. 7, Ht. 2.

————, 1930.—Die Süsswasser-flora Mitteleuropas, Ht. 10, Diatomeae (Jena).

MANGIN, L., 1914.—Sur le polymorphisme de certaines diatomées de l'Antarctique. *Compt. Rend. Acad. Sci., Paris*, 159 : 476-484.

MANN, A., 1937.—Diatoms. *Australasian Antarctic Expedition, 1911-14*, Scientific Reports, Series C, Zool. and Bot., Vol. I, pt. I.

MAWSON, D., 1943.—Macquarie Island, its Geography and Geology (from the records of L. R. Blake). *Australasian Antarctic Expedition, 1911-14*, Scientific Reports, Series A, Vol. V.

MÜLLER, O., 1909.—Incomplete reference from Peragallo, 1921.

O'MEARA, E., 1876.—On the Diatomaceous Gatherings made at Kerguelen's Land by H. N. Moseley, H.M.S. "Challenger", *J. Linn. Soc.*, Bot., XV : 55-59.

PERAGALLO, M., 1921.—Diatomées d'Eau Douce. *Expédition Antarctique Français, 1908-10.*

PETERSON, J. BOYE, 1935.—Studies on the Biology and Taxonomy of Soil Algae. *Dansk. Botanisk Arkiv*, 8 : 1-172.

PETIT, P., 1888.—Diatomées récoltées dans le voisinage du Cap Horn. *Mission scientifique du Cap Horn.* T.V. Botanique.

PIPER, C. S., 1938.—Soils from Subantarctic Islands. Section 1. An examination of soils from Possession, Heard, Kerguelen and Macquarie Islands. *B.A.N.Z.A.R.E., 1929-31.* Scientific Reports, Series A, Vol. II, pt. 7.

POLUNIN, N., and KELLY, C. D., 1952.—Arctic Aerobiology. Fungi, bacteria, etc., caught in the air during flights over the geographical North Pole. *Nature*, 170, No. 4321.

PRINGSHEIM, E. G., 1950.—The Cultivation of Algae. *Endeavour*, 9, No. 35 : 138-143.

PRITCHARD'S Infusoria, London, 1861.

REINSCH, P. F., 1876.—Species ac Genera nova Algarum aquae dulcis, quae sunt inventa in speciminibus in expeditione Vener. transit. hieme 1874-75 in insula Kerguelensi a clar Eaton collectis. *J. Linn. Soc.*, Bot., XV : 205-221.

————, 1879.—Fresh water algae collected by the Rev. A. E. Eaton. Algae aquae dulcis Insulae Kerguelensis. *Phil. Trans. Roy. Soc. London*, 168 : 65-92.

————, 1890.— Die Süsswasseralgenflora von Süd-Georgien, in G. Neumayer, *Die deutschen Expeditionen und ihre Ergebnisse*, Bd. II : 329-365, tabb. 1-4.

RUDMOSE BROWN, R. N., 1912.—The Problems of Antarctic Plant Life. *Botanical results of the Scottish National Antarctic Expedition.*

SCHMIDT, A., 1874-1938.—Atlas der Diatomaceenkunde. Fortgesetzt von M. Schmidt, F. Fricke, O. Müller, H. Heiden und F. Hustedt. Aschersleben-Leipzig.

SMITH, W., 1853-56.—Synopsis of the British Diatomaceae. London. (Vols. 1 and 2.)

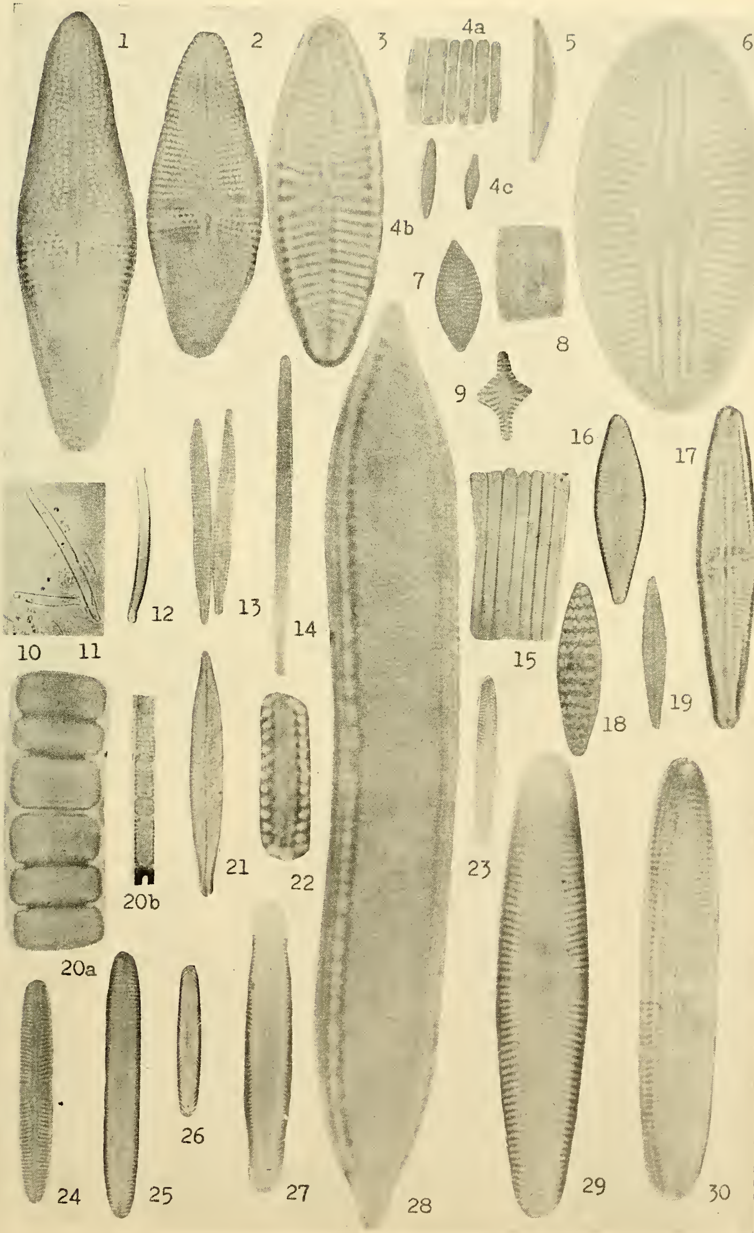
STEVENSON, I. L., and LOCHHEAD, A. G., 1953.—The use of a percolation technique in studying antibiotic production in soil. *Canad. J. Bot.*, 31 : 23-27.

VAN OVEREEM, MARIE A., 1937.—On Green Organisms Occurring in the Lower Troposphere. *Recueil des Travaux Botaniques Neerlandais*, 34 : 388.

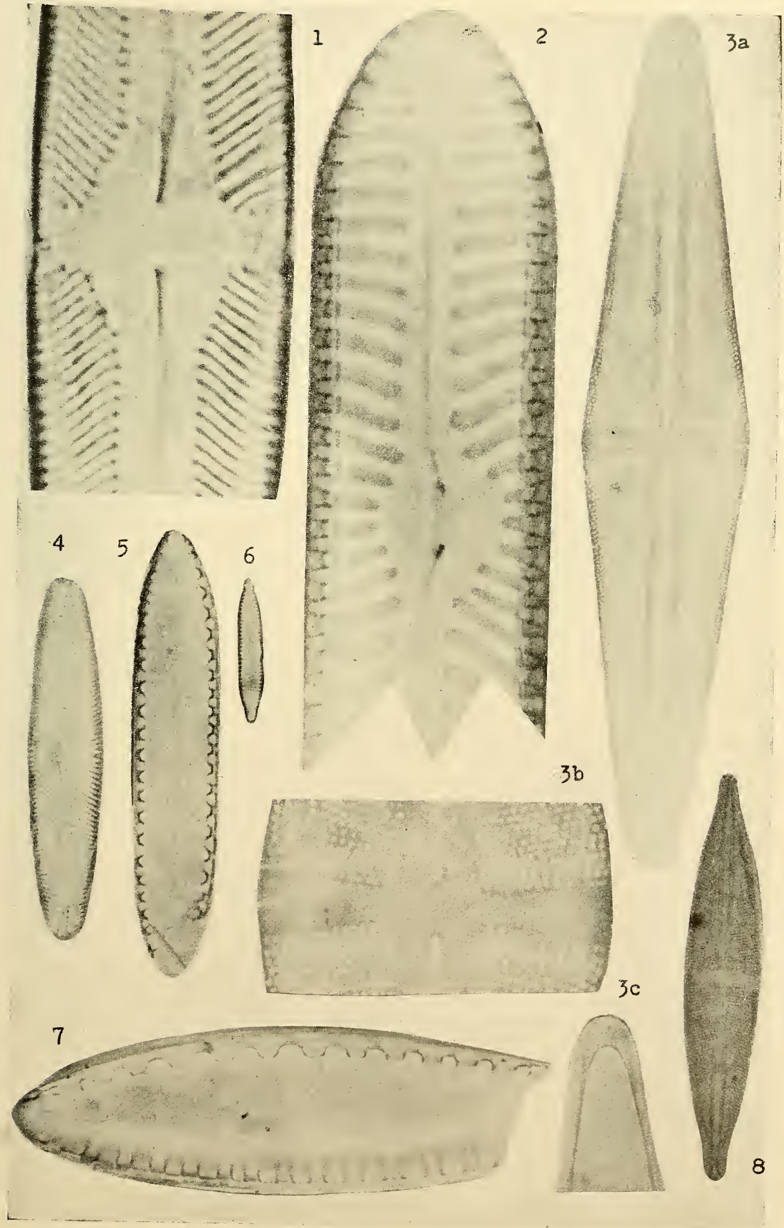
WEST, W. and G. S., 1911.—Freshwater Algae. *British Antarctic Expedition, 1907-9*, Scientific Reports, Vol. I, pt. VII.

WILSON, O. T., 1927.—Asymmetric variation in *Cocconeis scutellum* Eh. *Am. J. Bot.*, 14 : 267.

Hibbertia serrata, sp. nov.



Diatoms from Macquarie Island.



Diatoms from Macquarie Island.